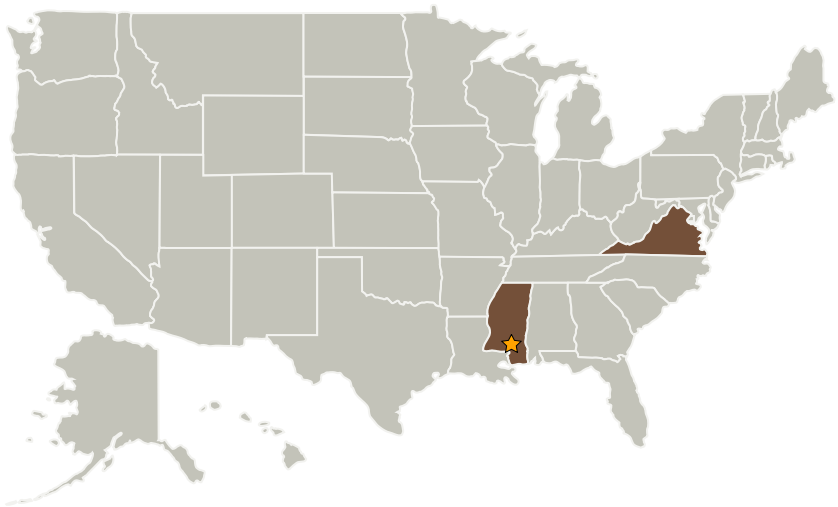
# High-Speed Thermal Characterization of Cryogenic Flows, Phase II

Completed Technology Project (2006 - 2008)

## Project Introduction

Luna proposes to continue development on a high-speed fiber optic sensor and readout system for cryogenic temperature measurements in liquid oxygen (LOX) and liquid hydrogen (LH2). This work will be based on the solid proof of feasibility completed during the Phase I STTR project and will result in 1) extremely high-speed, minimally-intrusive fiber optic temperature sensors for cryogenic and high-temperature applications and 2) an industrially robust, turn-key fiber optic readout system capable of servicing numerous sensor types, addressing a broad range of needs within NASA. The sensors and system developed here will be specifically designed to meet NASA Stennis needs for facility and test article health-monitoring. Additionally, the basic readout system could be extended to include rotary and linear position for valve position feedback, which supports NASA's stated need for smart system components such as control valves, regulators, and relief valves that provide real-time, closed-loop control, component configuration, automated operation, and component health. Luna's research subcontractor, Virginia Tech, will develop new and improved methods to accurately model the transient interaction between cryogenic fluid flow and immersed sensors that predict the dynamic load on the sensors, frequency spectrum, heat transfer, and effect on the flow field as part of this effort.

## Primary U.S. Work Locations and Key Partners

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## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Center / Facility:**

Stennis Space Center (SSC)

**Responsible Program:**

Small Business Innovation Research/Small Business Tech Transfer

**Small Business Innovation Research/Small Business Tech Transfer**

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| Organizations Performing Work | Role | Type | Location |
|---|---|---|---|
| ★Stennis Space Center(SSC) | Lead Organization | NASA Center | Stennis Space Center, Mississippi |
| Luna Innovations, Inc. | Supporting Organization | Industry | Roanoke, Virginia |

| Primary U.S. Work Locations | |
|---|---|
| Mississippi | Virginia |

## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

Carlos Torrez

## Technology Areas

**Primary:**

- TX14 Thermal Management Systems
  - TX14.1 Cryogenic Systems
    - TX14.1.3 Thermal Conditioning for Sensors, Instruments, and High Efficiency Electric Motors